



Expedition 23 & 24 Countermeasures CRR

Medical Operations

Presenter **Carly Toder**
Iona Gipson, Danielle Conly
Linda Nieschwitz, Austin Perk

Date
Feb 4, 2010

**Countermeasures
(iRED, ARED CEVIS, MEC, TVIS, T2, Periodic
Fitness Evaluation, BP - ECG, HRM,)**

Critical Readiness Review Increment 23 & 24

**SD230A/
C. Toder x 41797
D. Conly x34778
I. Gipson x38054
L. Nieschwitz x 35155
Austin Perk x 42376
Wyle**



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Updates

- **iRED:**
 - Stowed. If needed, S&M analysis will need to be conducted.
- **ARED:**
 - ARED will be relocated to Node 3 (NOD3F2) during 20A Docked Ops.
 - Possible additional activities during expedition: X-Rotation Bias Check, Cylinder Valve and Head Cap Seal Leak Detection, On-Orbit Data Capture
 - Two spare dashpots on-orbit. Continue to fly dashpots as needed.



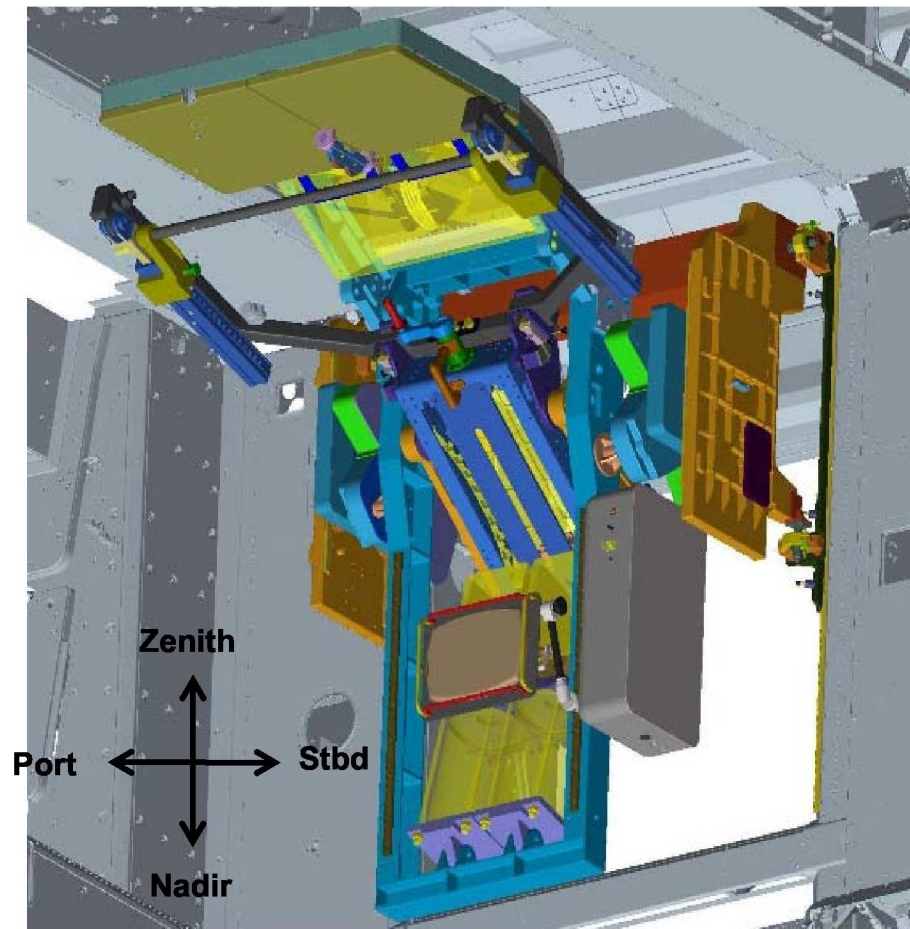
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ARED Node 3 Orientation





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- **CEVIS:**

- **A new Ergometer will be flown on ULF6 along with a Forward Mounting Block and an Aft Mounting Block. A CEVIS R&R is currently scheduled for docked ops.**
- **New CEVIS Seat Cushion will be flown on 20A. It will be installed and the Shuttle Ergometer Seat Cushions (2) will remain onboard as backups.**
- **The annual Guide Pin Maintenance will not be due in August since a new CEVIS will be installed in July.**

- **MEC:**

- **Will be transitioning to the SSC load Fall 2010**
- **In the meantime, Exercise Application can now handle FE3, FE4, FE5, FE6. OTLs working on implementation.**



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- **TVIS:**

- **TVIS Forward right stabilizer spring were replaced. 12 springs flew on 17A for the remaining stabilizers.**
- **VIS Internal Power Sharing anomaly under investigation –**
 - » **Forward right troubleshooting on 20A slip plan.**
 - » **FE-1 (Max) has 10 km/hr speed restriction. CDR (Jeff) will have speed restriction assessed 2/5.**
- **Maintenance due in April.**
- **Details of handover to Russians still TBD.**

- **Harness SDTO:**

- **Participating crewmembers: Jeff Williams, Soichi Noguchi and T. J. Creamer, Wheeler, Walker**
- **Harness and Instrumentation kits on HTV/20S/ULF3/ULF4.**



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- **BD-1:**
 - No updates
- **T2:**
 - Being relocated to NOD3F5 during 20A stage
 - New orange Snubber Alignment Guides flying on 20A
 - Post-relocate Acoustic Test will be performed in Node3
 - Spare Isolators flying on 19A
 - Software CR addressing issues encountered during ACO (e.g. Data transfer issues, Passive workload completion, etc) ECD June 2010.



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- **PFE:**
 - **Three crewmembers will be participating in the VO2 Max activity. This activity will take the place of the PFE for the participating crewmembers. All other crewmembers will continue to perform PFEs per the nominal schedule.**
- **BP/ECG:**
 - **A new BP/ECG Kit will be flying on ULF6.**
 - **There are plenty of unexpired subpacks onboard.**
- **HRM2:**
 - **A Resupply Kit will be flown on 19A (contains 4 watches, chest straps, and transmitters).**
 - **All old HRM hardware has been trashed.**



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Backup Slides

Resistive Exercise Device (RED)

- iRED was installed, removed, and stowed in JLP1A1 during Increment 20.
- Procedures on orbit to install in Node 1 Overhead, Node 2 Overhead, and Node 2 Deck.



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Advanced Resistive Exercise Device (ARED)

- ARED launched on ULF-2 and was installed into Node 1 Zenith and checked out in December 2008/January 2009.
- ARED has a maximum load for the Lift Bar of 600 lbs. and 150 lbs. for the Exercise Rope.
- Prescriptions are generated with a web-based ARED ground software program by the ASCR's. ARED OTL sends to console for uplink to the ISS LAN ~ once/month
- Crew update files will be sent to console for uplink just prior to a crewmember rotation.



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Nominal ARED Maintenance

- ARED Evacuate Cylinder Flywheel – once per week (15 minutes)
- ARED Exercise Rope Replacement – every 31,500 cycles (~2.5 months for 6 CM) (75 minutes x 2 Crewmembers)
- ARED Cable Arm Rope Replacement – every 69,306 cycles (~5.5 months for 6 CM) (60 minutes x 1 Crewmember)
- ARED VIS Rail Inspection – every 2 weeks (10 minutes)
- ARED VIS Rail Greasing- every 2 months (60 minutes)
- ARED Sensor Calibration- once per year (60 minutes x 2 Crewmembers)



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As Required ARED Maintenance

- **Moving ARED**
 - Detach from VIS (55 min./ 60 min.)
 - Position for ISS Equipment Translation or Maintenance (20 min.)
 - Remove for Z1 Access (35 min. / 45 min.)
 - Stow for Fire Port Access (3 min. / 3 min.)
- **Software Installation (5 min.)**
 - Can't do until engineering can supply a USB keyboard.



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Cycle Ergometer with Vibration Isolation & Stabilization (CEVIS)

- CEVIS Ergometer was flown and assembled on 13A.1 (Aug 2008)
- CEVIS Display/Control panel failed Jan 2008
- Replacement CEVIS Control Panel (new -302) flew on 15A (Feb 2009)
- Seat Back Cushion reported Ripped, January 2008
 - Swapped with Shuttle Ergometer Seat Cushion, STS-122/1E (Feb 2008)
 - Additional Shuttle Ergometer Seat Cushion stowed as backup



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Cycle Ergometer with Vibration Isolation & Stabilization (CEVIS)

- Isolators:
 - CEVIS isolators remain stuffed with socks to improve stabilization.
 - Isolator Inspection frequency is every 3 months.
 - 2 Isolator Kits onboard (empty one is underneath CMRS)
 - 2 set of 4" isolators
 - 0 set of 6" isolators
- Guide Pin Maintenance procedure
 - lubrication to prevent failure of rotation of CEVIS



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MEC

- **Upgrade to A31p version 2 occurred February 18, 2008.**
 - Flew on DVD, so time required is shorter than last version.
- **Exercise Ids will be uplinked to MEC.**
- **Future work: Fall 2010 for upgrade to SSC load.**



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Treadmill with Vibration Isolation and Stabilization (TVIS)

- **Harness:**
 - Harnesses prepositioned for Expedition 23/24 Crew (see also SDTO slide).
- **Loading**
 - Subject Load Devices (SLD) available for loading entire increment. Series Bungee System (SBS) Assemblies will be used as a backup if needed.
- **Speed**
 - Due to the Internal VIS Power Supply Anomaly, individual speed restrictions will be set after reviewing the crewmember's data.
 - Speed Placard has been set to 10 mph. The Speed Placard will stay the same for Expedition 23/24 and can be removed as soon as one Crewmember runs at that speed and provides one data point.
- **Roller Bearings**
 - Roller Bearings were upgraded to the blue rubber during the Expedition 19 TVIS Maintenance and most likely during the April Maintenance a roller bearing will be removed for analysis.



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TVIS Maintenance

- Nominal activities:

- 1) TVIS Weekly Maintenance – 10 minutes/week – only when SLDs are in use
- 2) TVIS Monthly Inspection – 25 minutes/month to inspect Time/Date on Control Panel, Corner Bracket Ropes, Gyroscope Wire Ropes, Treadmill Harness and SPDs (if in use).
- 3) TVIS Quarterly Inspection – 65 minutes/3 months - Additional 30 minutes added to nominal Monthly Inspection to inspect SBS, Belt Tension, Belt Slat Screws and Belt Slats
- 4) TVIS 6 Month Maintenance – deferred to annual

Contingency Maintenance:

- 1) TVIS VIS Internal Power Supply Troubleshooting – Will narrow down to the Suspect Stabilizer, then determine which ORU is responsible (Stabilizer, power cable, VIS.)
- 2) TVIS Stabilizer Springs – remaining springs to be replaced, TBD
- 3) Belt Tightening/Slat Inspection- acoustic testing revealed a belt slat is striking the chassis. Inspection and Correction needed. Belt tightening also needed.
- 4) Blue Roller Inspection – inspection of blue rollers needed to extend life.



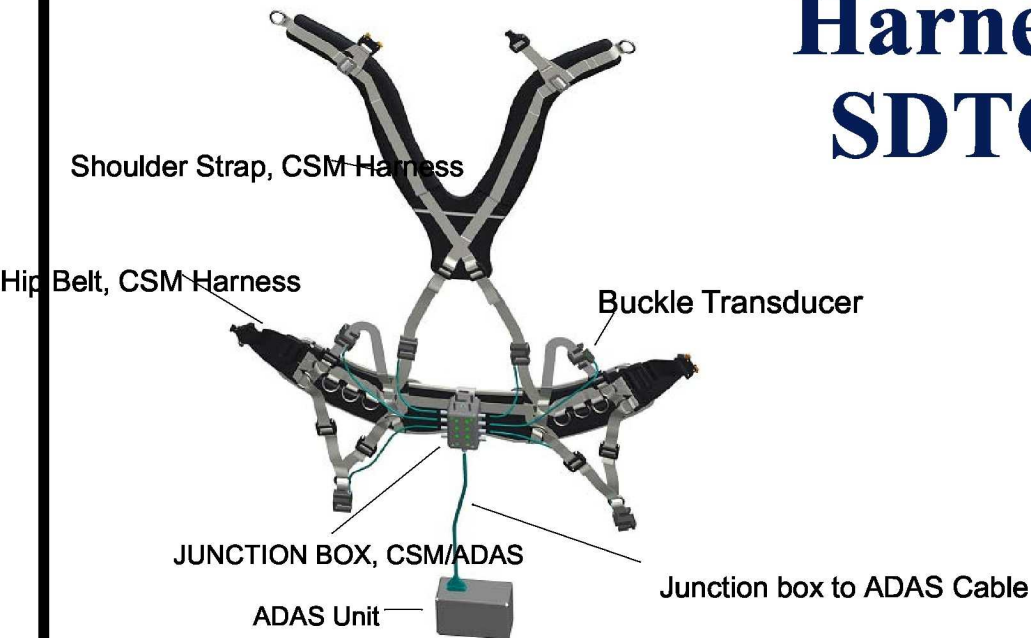
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Harness SDTO



- New harnesses will arrive on HTV/20S/ULf3/ULF4 as part of an SDTO.
- Current harness design will be used along with the new design in a comparison study (on-orbit)
- Data will be collected from exercise sessions using both harnesses and a follow-up questionnaire will be completed by participating Crewmembers.
- Data will only be collected every 4 exercise sessions .
- The instrumentation will also fit on the Current Treadmill Harness.



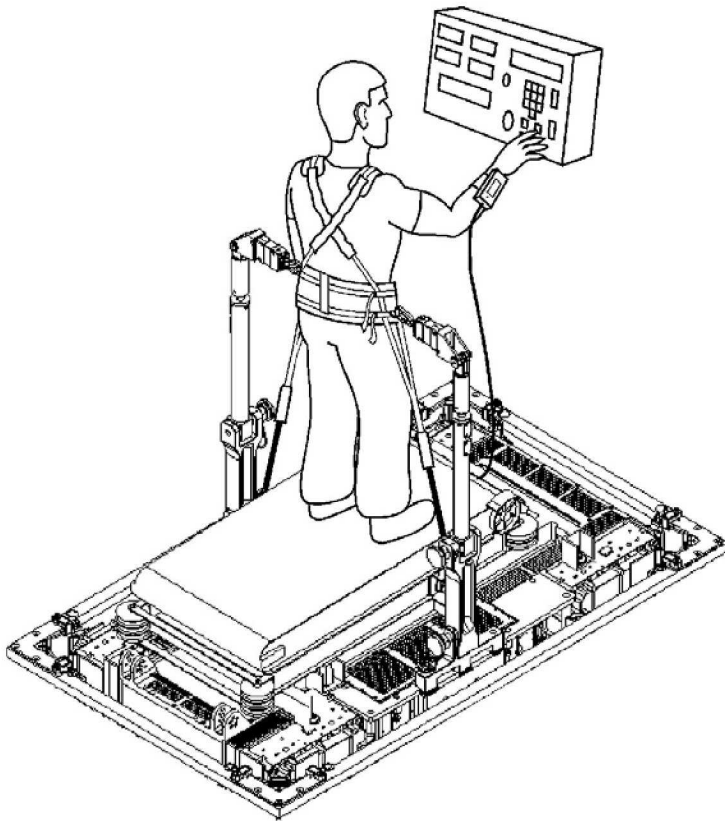
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BD-1



- Russian contingency treadmill, BD-1, arrived on 15P.
- BD-1 requires fully operational VIS system, as well as TVIS Electronics Box and Control Panel to operate.
- 2 Russian BD-1 Harnesses flew on 16P (should not be used for TVIS exercise)
- After BD-1 ACO, CES can be thrown away (w/ approved WMR), but CES fasteners must be kept for BD-1 installation.



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Treadmill 2 (T2)

- Location:
 - Currently NOD2D5, will be NOD3F5 after Node 3 arrives
- Harness:
 - Will be same harnesses as TVIS
- Loading:
 - Will use SBS (same as TVIS) until Subject Loading System arrives on a later flight (not in Inc 20/21).
- Operational Constraints:
 - Heavy Data Collection between sessions 5-10 for all new crewmembers
 - Speeds 3mph-9mph, 130lbs loading, must use handrails
 - If exercising outside of these boundaries, heavy data collection must be setup on T2 along with SAMS and video coordination.





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T2 Maintenance

- Nominal activities:
 - 1) Weekly Cleaning – 10 minutes/week – will not be scheduled but will be included in last Crewmember to exercise on T2 daily (per Crew request)
 - 2) Quarterly Inspection – 10 minutes/3 months – Inspect all SBS in use
 - 3) 6 Month Maintenance – 120 min/6 months - Inspection of the SLS (to be installed in 2011), Vacuum and cleaning under covers, Belt cleaning and inspection, Belt tension check, Sharp edge inspection.
 - 4) Yearly Maintenance – 6 MM + 30 min/12 months - Grease front and rear drum, Grease drive shaft, Inspect drive shaft teeth, Inspect VIS Isolators



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T2 Maintenance (in work)

Additional unapproved routine inspections being requested in Chit 8215:

1) Monthly

- X and Z Jam Nut inspections
- Snubber Arm Fastener inspections

2) Quarterly

- T2 Pin Alignment and Centering Inspection
- Load Cell Calibration



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Periodic Fitness Evaluation

- To be performed by USOS crewmembers every 30 days, starting FD14.
- Periodic Fitness Evaluation – Nominal Operations should be used with the new CEVIS Control Panel that was delivered by 15A. Periodic Fitness Evaluation - With CEVIS Contingency Controller is available if needed.



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BP / ECG

- Used during Periodic Fitness Evaluations and for contingencies.
- A refurbished unit was flown on 29P (May 2008).
- 20 subpacks were flown on 34P (July 2009) with an expiration date of 4/30/10.
- 40 additional subpacks were flown on HTV1 (Sept 2009) with an expiration date of 7/31/11.



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Heart Rate Monitor 2 (HRM2)

- HRM2 provides more storage capability and is easier to download to the MEC. There is a longer transmission range between the transmitter/watch and transmitter/Control Panels.
- HRM Chest Strap and HRM Transmitter are required for use on TVIS and CEVIS. HRM Watch may be worn to collect data for either session if desired. HRM Download to MEC/File Erase will need to occur if this is done.



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Data Distribution

- Exercise data downlinked will be scheduled daily per Expedition 23/24 crew preference.
- PFE data (CEVIS and BP/ECG) to be downlinked day of evaluation.
- Data from Russian crewmembers to be given to Russian medical team once processed (run through ground utility program for viewing).
- New protocols for RED go through CHeCS Medical Software Uplink Checklist process prior to uplink. Anticipate crew to use MEC for RED this increment only as contingency.
- US crewmember must report if Russian crew utilizes RED so accurate cycle life/can life tracking may be obtained.
- ARED protocols and uplink files are created in the ground software and then uplinked directly to the ARED Display.



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- T2 protocols and uplink files are created in the ground software and then uplinked to the T2 folder on the SSC File Server. When the T2 Display is activated, it will grab these files from the file sever and store and load them on the display.
- Surgeon must report TVIS & T2 loading for SBS (if in use) with number of French clips for TVIS & T2 Ops Team Lead (OTL) to provide to Engineering for data analysis and tracking hardware life.
- CMS Ops Team will meet with Expedition 23/24 Surgeons and ASCRS on weekly basis in IMC.
- RED OTL provides weekly ARED or RED cycle count to Engineering and BME Increment Manager for consumables report.
- Expedition 23/24 specific CMS Stowage Matrix will be uplinked prior to crew arrival with detailed information concerning which hardware to use. BME will work with ISO to generate message. Another message will be uplinked upon the arrival of a rotating Crewmember.